

## CONSUMER MISTAKES IN THE MORTGAGE MARKET: CHOOSING UNWISELY VERSUS NOT SWITCHING WISELY

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### ABSTRACT

*Regulatory proposals for protecting consumers in the mortgage markets typically focus on making sure dangerous products are eliminated and consumers make informed product-choice decisions. These are intended to address consumers' product-choice mistakes. But there is another class of mistakes that has received relatively little attention in the current regulatory debate: consumers' failure to switch out of their mortgage products by refinancing in a timely manner. Studies have shown that once consumers choose mortgage products, they are slow to take advantage of reduced interest rates by refinancing efficiently. This is potentially worth several thousand dollars in interest cost savings. Safety or disclosure regulation can do very little to entice borrowers who are not constantly looking to maximize welfare. This Article makes three contributions: first, we rationalize failure-to-switch mistakes, using a neoclassical model of product search and market obfuscation; second, we explain why the market is unlikely to correct failure-to-switch mistakes on its own, based on the lessons we have learned about product-choice*

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*mistakes; third, we propose a simple solution that could potentially be effective in addressing sluggish refinancing. Our threshold suggestion is that the Consumer Financial Protection Bureau should establish, certify, and popularize a simple concept or methodology—much like APR—which conveys the net wealth and risk effects of refinancing to a given product. By creating a common language for consumers, lenders, and brokers, this approach can reduce consumers' information costs, teach them to demand information in a useful format, combat market obfuscation, and importantly, encourage several market-based solutions in turn.*

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## INTRODUCTION

Mortgage products facilitate household debt financing. At any given moment millions of people are seeking new products, and millions are already under some obligation to pay back existing debts.

As such, there are two ways of talking about consumers' welfare in the context of the mortgage market at any given moment. First, for those seeking new mortgage products we can ask whether they are making product-choice decisions wisely and according to reasonable expectations of their future states. Second, for those with existing mortgage payment obligations, secured when the interest rate was higher, we can ask whether they may be foregoing clearly wealth-enhancing refinancing options that are now available.

Regulation of mortgage products has been a hot topic of discussion lately, and for good reason.<sup>1</sup> The mounting level of household debt and increased default rates led to the most recent financial crisis.<sup>2</sup> The crisis led to the enactment of the Dodd-Frank Wall Street Reform and Consumer Protection Act (the "Dodd-Frank Act"), culminating with the establishment of the Consumer Financial Protection Bureau (the "Bureau").<sup>3</sup> The Bureau is statutorily tasked to make sure that "the markets for consumer financial products and services are fair, transparent, and competitive."<sup>4</sup> Suggestions for improving the mortgage market have ranged from more effective disclosure regulation<sup>5</sup> and behaviorally-informed policy choices<sup>6</sup>—on the

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1. For a general case for consumer financial protection, see John Y. Campbell et al., *Consumer Financial Protection*, 25 J. ECON. PERSP. 91 (2011) [hereinafter Campbell, *Consumer Financial Protection*].

2. See Atif R. Mian & Amir Sufi, *The Consequences of Mortgage Credit Expansion: Evidence from the U.S. Mortgage Default Crisis*, 124 Q. J. ECON. 1449, 1449 (2009) (explaining that "the sharp rise in U.S. mortgage default rates has led to the most severe financial crisis since the Great Depression").

3. For more background on the impetus leading to the financial regulatory reform and the creation of the Consumer Financial Protection Bureau, see DEPT. OF THE TREASURY, FINANCIAL REGULATORY REFORM A NEW FOUNDATION: REBUILDING FINANCIAL SUPERVISION AND REGULATION (2009), [http://www.treasury.gov/initiatives/Documents/FinalReport\\_web.pdf](http://www.treasury.gov/initiatives/Documents/FinalReport_web.pdf).

4. Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111–203, § 1021 (2010).

5. See, e.g., Richard A. Epstein, *Exchange: The Neoclassical Economics of Consumer Contracts*, 92 MINN. L. REV. 803, 835 (2008) (explaining that new disclosure regulations "are likely to provide at most ephemeral gains at best to the bottom end of the distribution, but only at a high price for everyone else"); Richard A. Epstein, *Behavioral Economics: Human Errors and Market Corrections*, 73 U. CHI. L. REV. 111 (2006) (discussing rational decision-making in the face of cognitive and emotional impairments).

6. See, e.g., Michael S. Barr et al., *Behaviorally Informed Home Mortgage Regulation*, in IN BORROWING TO LIVE: CONSUMER AND MORTGAGE CREDIT REVISITED (N. Retsinas & E.

softer side—to imposing fiduciary duties on brokers or lenders and something akin to safety regulation of credit products—on the stronger side.<sup>7</sup>

But the discourse to date has focused almost exclusively on having consumers make wise product-choice decisions.<sup>8</sup> This approach would make sense in a market for non-refundable goods: for example, if you are buying an MP3 music file, choosing the right product at the right price is the only dimension of concern. Once you make your purchase, you are stuck with it and there's no remedial measure, except not listening to it. But many mortgage products are refundable—or more accurately, *replaceable*. You can refinance and switch to an alternative product, albeit at a cost.<sup>9</sup> Moreover, your existing mortgage obligation becomes comparatively less desirable as the market's interest rate declines below the coupon rate.

As it happens, empirical evidence indicates that a significant segment of consumers exhibit a sluggish behavior in refinancing in a declining interest rate environment, even in the absence of any obvious constraints.<sup>10</sup> One might say the problem with the mortgage market is not just that the consumer is not making *the* right decision at the moment of purchase; rather, he may not be *constantly* making right decisions. Consequently, in furthering its mission of consumer protecting, the Bureau should seek to ensure that consumers not only choose wisely but also switch wisely.

The central claim in this Article is that consumers' product-choice mistakes and failure-to-switch mistakes are *heuristically distinct* but *economically equivalent*. Put differently, as mathematical optimization problems individual consumers must solve, these two mistakes are different in nature. By contrast, as economic problems to our society the government may wish to address, these two are essentially equivalent in the sense that (i) they share similar underlying causes, (ii) they result in similar economic effects overall, and (iii) efforts to address them will also bring

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Belsky, eds. 2008) (introducing an opt-out mortgage policy).

7. See, e.g., Oren Bar-Gill & Elizabeth Warren, *Making Credit Safer*, 157 U. PA. L. REV. 1, 1–2 (2008) (using a “physical products analogy to build a case, supported by both theory and data, for comprehensive safety regulation of consumer credit”).

8. Two notable exceptions are the proposal for automatic refinancing mortgage products and the proposal for abolishing the requirement for reissuing title insurance in refinancing, discussed in Part III.

9. The additional cost includes the cost of searching and switching. The switching cost may also depend on credit terms as well as any fixed cost involved in switching. If a mortgage product comes with a prepayment penalty during the early years of repayment, then the cost of switching may be high.

10. See *infra* Part I. Our discussion in this Article does not pertain to cash-out refinancing.

about mostly similar outcomes. This implies, on the one hand, that solutions intended to address product-choice mistakes are unlikely to be effective in addressing failure-to-switch mistakes; on the other hand, it also indicates that, from a policy perspective, it does not make sense to address one type of mistake but not the other—unless this is a conscious, informed decision based on a drawing of a line as a matter of degree.

Although sluggish refinancing—or consumers’ failure to switch out of their given mortgage products—has been documented for some time, the existing literature has been slow to rationalize it or otherwise suggest solutions. Our main contribution to the literature is theorizing failure-to-switch mistakes and comparing and contrasting them with product-choice mistakes. This is the first article—we know of—that rationalizes failure-to-switch mistakes using a neoclassical model, and we do so by introducing a model of product search and market obfuscation. We do not dispute the possibility that some amount of failure-to-switch can be attributed to consumer’s inertia or status quo bias, which is now well-documented. However, based on available evidence, we also believe that consumers’ failures to switch efficiently can be further rationalized by the lack of transparency in the refinancing market whereby consumers cannot easily comprehend the wealth and risk consequences of refinancing. Therefore, unsophisticated consumers facing high search-and-switching costs are, so to speak, demanding a premium in the form of a sufficient interest rate decline before searching into given product offers. This in turn results in a delay in refinancing in a declining interest rate environment.

This Article also provides an in-depth analysis as to why the market left to its own is unlikely to solve failure-to-switch mistakes. Specifically, we argue that the set of market failures that accounts for the persistence of product-choice mistakes can similarly explain the persistence of failure-to-switch mistakes. These include: collective action problems among lenders, high transaction costs of identifying potential consumers, ineffective competitor advertising, implicit lender collusion, and the market’s insufficient incentive to educate borrowers. All of them allow the market to maintain a positive level of obfuscation. The two categories of mistakes are therefore simply different manifestations of the same general phenomenon: for consumers intent on selecting mortgage products, obfuscation can lead them to choose unwisely; for consumers with no exogenous need to select mortgage products, obfuscation can force them to wait too long and thus, to fail to switch wisely. It is in this sense the two types are causally analogous.

We also discuss possible justifications for the government to address failure-to-switch mistakes. Failure-to-switch mistakes are, at the end of the day, errors in judgment among less sophisticated consumers—the same

demographic as those who as a group are also more likely to make product-choice mistakes. To this extent, both types of mistakes lead to analogous economic consequences. First, they involve rent extraction by lenders from and cross-subsidization of sophisticated consumers by unsophisticated consumers. Second, to the extent that they both involve a group of consumers who do not fully internalize wealth and risk consequences of their decisions, there is also an allocative efficiency problem as well. In turn, regulatory solutions intended to address failure-to-switch mistakes and product-choice mistakes will also have consequentially similar effects on the economy. We also discuss how lenders may react in response to potential regulation addressing failure-to-switch mistakes.

Our analysis leads to some normative policy implications. Although the government can take several different measures to render refinancing more efficient, we highlight a measure that, we believe, is the least intrusive and the most intuitive (and perhaps the most politically viable). We argue that, as a first step, the Bureau should empower consumers to search and switch efficiently by establishing, certifying, and popularizing a standard bottom-line, product-comparison methodology or concept that conveys the net wealth and risk effects of switching from one mortgage to another. In much the same way effective disclosure regulation can help consumers understand the full wealth and risk consequences of signing up for a particular mortgage product, the product-comparison methodology should help consumers quickly understand the comparative wealth and risk consequences of switching from one product to another. We think this can go a long way in reducing the gap in consumer sophistication. There should be additional measures to help consumers overcome their status quo bias or inertia. However, once the Bureau establishes such a methodology or concept—a common language of sort—as a result of consumers' demand, the market may introduce a host of innovative measures that encourage more efficient refinancing.

The rest of the Article is organized as follows. Part I reviews empirical evidence on consumers' sluggish refinancing behavior as their failure to switch wisely. Part II provides a general economic analysis of consumer mistakes in the mortgage market and also rationalizes failure-to-switch mistakes. Part III proposes preliminary measures the government can take to reduce the search-and-switching costs, thereby helping consumers improve their ex post welfare. Part IV concludes the discussion. The Appendix includes proofs of the propositions.

## I. EVIDENCE OF SLUGGISH REFINANCING AS FAILURE-TO-SWITCH MISTAKES

Despite the prospect of a large saving, many borrowers are slow to refinance in a declining interest rate environment.<sup>11</sup> Three points of clarification are in order. First, whether consumers are *slow* to refinance is a concept relative to the falling interest rate. Recent rate declines have indeed triggered vigorous refinancing activities. But to the extent there still remains a significant segment of consumers who could benefit substantially from refinancing but are not choosing to, this is foregone consumer surplus. Second, sluggish refinancing should not be viewed merely as a consequence of switching costs, because we are discussing opportunities that can yield in a substantial saving for consumers *even after* incurring all necessary switching costs. Third, “refinancing” in this Article refers only to the case of refinancing the existing mortgage to take advantage of reduced interest rate. Our analysis does not apply to cash-out refinancing, which depends not only on available interest rate but also on the general condition of the housing market and the consumer’s future expected income stream.

That said, there are legitimate reasons as to why a given individual borrower may *appear* sluggish in refinancing: (i) he may in actuality be “locked in” from refinancing as a result of a significant decline in his home value;<sup>12</sup> (ii) he may not qualify for attractive rates due to his low credit scores; (iii) he may be expecting to move in the near future; or (iv) he has reason to believe the rate will decline further still in the near future. In other words, not all instances of sluggish refinancing can be considered mistakes on the consumer’s part.

Recent studies, however, have controlled for many of these factors and have ultimately come to view the residual, unexplainable segment behavior as mistakes from consumers who lack sophistication in refinancing. For example, Campbell documents that as of 2003, a quarter of the households from his sample were paying more than two percent above the prevailing market rate, even after controlling for other adverse

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11. We are concerned only with home equity extraction refinancing—refinancing to reduce monthly payments by reducing the interest rate associated with borrowing. It does not deal with cash-out refinancing.

12. See, e.g., Andrew Caplin et al., *Collateral Damage: Refinancing Constraints and Regional Recessions*, 29 J. MONEY, CREDIT & BANKING 496 (1997) (arguing that decreased property values constrain mortgage refinancing); Wayne Archer et al., *The Effect of Income and Collateral Constraints on Residential Mortgage Termination*, 25–26 (Nat’l Bureau of Econ. Research, Working Paper No. 5180, 1996) (exploring household characteristics on mortgage prepayment behavior).

factors such as declined property value and likelihood of relocation.<sup>13</sup> For a two hundred thousand dollar loan, for example, this error could translate to, on average, four thousand to six thousand dollars a year that could readily be saved.<sup>14</sup> Importantly, Campbell documents that those borrowers who were less educated, earned lower income, and members of a minority group were more likely to suffer from failing to refinance<sup>15</sup>—a finding shared by a number of subsequent studies.<sup>16</sup> He concludes that “prompt refinancing requires financial sophistication.”<sup>17</sup> This is a crucial observation because it indicates that *any satisfactory theory of failure-to-switch mistakes should account for the systematic gap based on consumer sophistication.*

Campbell does not completely rule out the possibility “that better-educated household have better credit quality and can obtain mortgages on more favorable terms.” But he finds that even after controlling for mortgage rates *likely* available to households, “the effects of race and education remain significant.”<sup>18</sup> He concludes that these must be irrational investment mistakes. As further support, he notes that many households appear not to be even aware of their mortgage rates.<sup>19</sup>

Goodstein documents that, during the boom leading up to 2007, when the interest rate was *rising*, low- and moderate-income homeowners more

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13. John Y. Campbell, *Household Finance*, 61 J. FIN. 1553, 1579–85 (2006) [hereinafter Campbell, *Household Finance*].

14. This is an average calculation. The exact amount of savings would depend on how the loan is amortized, and how much of the principal the borrower has already paid off. This figure also does not capture the potential tax savings, which would also depend on the borrower’s tax bracket.

15. Campbell, *Household Finance*, *supra* note 13.

16. See, e.g., Simon Firestone et al., *The Performance of Low-Income and Minority Mortgages*, 35 REAL EST. ECON. 479, 479 (2007) (stating that “low-income borrowers are less likely to prepay when it is optimal, whereas black and Hispanic borrowers prepay more slowly than other borrowers, regardless of the option’s value”); Ryan M. Goodstein, *Refinancing Trends Among Lower Income Homeowners during the Housing Boom and Bust* 7 n.10 (Fed. Reserve Bd. Working Paper, 2011), available at [http://www.clevelandfed.org/2011policysummit/papers/C3\\_Goodstein.pdf](http://www.clevelandfed.org/2011policysummit/papers/C3_Goodstein.pdf) (illustrating that “from 2007 to 2010, the average credit score on owner occupied, 1–4 family mortgages increased from 713 to 761 for conventional loans, and from 626 to 702 for FHA loans . . .”).

17. Campbell, *Household Finance*, *supra* note 13, at 1581.

18. *Id.* at 1585. To arrive at this conclusion, Campbell replaced “self-reported mortgage rates with average Federal Home Loan Mortgage Corporation rates prevailing at the mortgage origination date . . .” *Id.*

19. *Id.* at 1584 n.27. To be sure, consumer irrationality has been documented in delayed refinancing in other contexts: for example, consumers have also been found to exhibit a sunk-cost fallacy in refinancing, whereby those who paid points to secure lower rates were less likely to refinance when the interest rate declined. Yan Chang & Abdullah Yavas, *Do Borrowers Make Rational Choices on Points and Refinancing?*, 1 (Working Paper, 2006), available at <http://www.vermontmortgageadvisor.com/assets/files/Chang.%20Yavas.%20PennState.pdf>.

frequently prepaid their mortgages; by contrast, after the 2007 collapse, as the interest rate was declining, the same group was slower to prepay their mortgages—indicating a pervasive refinancing mistake among low and moderate-income homeowners.<sup>20</sup> In its full specification, Goodstein’s model controls for credit and income constraints, collateral constraints, and other time invariant factors. He still finds that even after controlling for all these, the low- and moderate-income homeowners were slower to repay their mortgages.

Hedberg and Krainer document another interesting pattern—namely that refinancing seems to be particularly sluggish as the interest rate was approaching a historic low. They report that the prepayment data in 2010 was only half the expected rate<sup>21</sup> based on a predictive model calibrated using historical refinancing patterns: specifically, the rate of refinancing was 2.5 percent in reality as opposed to the predicted 5.26 percent. They further argue that fallen house prices cannot explain this discrepancy since the model accounts for such factors.<sup>22</sup> Although they provide several possible reasons, they ultimately conclude that the recent slow-down in refinancing cannot be explained by their models.<sup>23</sup> Their model thus suggests a possible nonlinear negative relationship between interest rate and the refinancing lag.

As anecdotal evidence, in October 2010, a special report by Moody’s Analytics also documented that “more than half of all outstanding mortgages carr[ied] coupons above 5.75%” when the interest rate was at “an all-time low of 4.32% at the end of September.”<sup>24</sup> As of September 2011, the interest rate was at another historic low, but the media again reported that consumers were slow to take advantage of the favorable opportunity.<sup>25</sup>

Overall, evidence seems fairly consistent that when the interest rate declines, many homeowners forego opportunities that can save them several thousand dollars a year. To be sure, multiple interpretations are possible with the given empirical evidence. Some sluggish refinancing may reflect a rational expectation of further rate decline. But this is not an

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20. Goodstein, *supra* note 16, at 23.

21. William Hedberg & John Krainer, *Mortgage Prepayments and Changing Underwriting Standards*, FRBSF ECON. LETTER (Fed. Reserve Bd., San Francisco, Cal.), July 19, 2010, at 3.

22. *Id.* at 4.

23. *Id.*

24. Mark Zandi & Cris Deritis, *Restraining HARP: The Case for More Refinancing Now*, MOODY’S ANALYTICS 1 (Oct. 7, 2010).

25. Chuck Jaffe, *Mortgage Rates at Record Lows, But No Re-Fi Boom*, MARKETWATCH (Sept. 15, 2011, 12:41 PM), <http://www.marketwatch.com/story/mortgage-rates-at-record-lows-but-no-re-fi-boom-2011-09-15>.

entirely satisfactory explanation in the aggregate: such interpretation would still require an explanation as to why a particular socioeconomic group of consumers is systematically *more* likely to expect a rate decline, compared to other consumers. Status quo bias or some type of consumer inertia may also help explain a portion of this refinancing lag. At the same time, we are reluctant to accept failure-to-switch mistakes solely as a broad result of “consumer inertia,” without compelling evidence establishing that less sophisticated consumers are more likely to suffer from the problem of inertia or laziness.

We note, however, an alternate hypothesis which cannot be rejected without further investigation: lenders may be systematically discriminating against certain types of consumers by not availing their best mortgage products to them. Indeed, if this hypothesis is true, it would account for both failure-to-switch mistakes as well as product-choice mistakes. For the time being, however, we have chosen to focus our inquiry on how lack of consumer sophistication can feed into consumers’ refinancing choices—in a manner consistent with most of the existing literature on consumer mistakes.

After all, it should not be altogether surprising that consumers fail to switch their mortgage products efficiently. Similar inefficient sticky behavior has been documented in the context of credit card management,<sup>26</sup> investment portfolio management such as 401(k) accounts,<sup>27</sup> and checking or savings accounts.<sup>28</sup> This may indicate that a more general case for empowering consumers to switch their replaceable financial products more swiftly. But it is not our intention to address this general inquiry in this Article. We focus on the case of refinancing for two reasons. First, because mortgage payments usually represent a major portion of household expenditure, consumers stand to save a significant amount from efficient refinancing. Second, this mistake belongs squarely within the types of

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26. See *infra* note 45.

27. See, e.g., Brigitte C. Madrian & Dennis F. Shea, *The Power of Suggestion: Inertia in 401(k) Participation and Savings Behavior*, 141 Q. J. ECON. 1149, 1158–66 (2001) (finding that 401(k) participation rates increase significantly under automatic enrollment plans).

28. See Elizabeth K. Kiser, *Household Switching Behavior at Depository Institutions: Evidence from Survey Data*, 47 ANTITRUST BULLETIN 619, 620 (2002) (explaining that consumers face a lag in switching depository institutions and documenting that customers are not sensitive to prices); Elizabeth K. Kiser, *Predicting Household Switching Behavior and Switching Costs at Depository Institutions*, 20 REV. OF INDUS. ORG. 349 (2002) (noting the resulting lag from switching depository institutions and customer insensitivity to price); Joanna Stavins, *Checking Accounts: What Do Banks Offer and What Do Consumers Value?*, 1999 NEW ENG. ECON. REV. 3, 11 (1999), available at <http://www.bos.frb.org/economic/neer/neer1999/neer299a.pdf> (“Because of high costs of switching banks, depositors respond to new charges with a lag.”).

economic inefficiencies regulators currently seek to address through mortgage regulation.

## II. ECONOMIC ANALYSIS OF PRODUCT-CHOICE MISTAKES VERSUS FAILURE-TO-SWITCH MISTAKES

The first part of business before engaging in an economic analysis of consumer mistakes is to understand what is meant by a “mistake” in this literature. We all make judgment calls that are *ex ante* reasonable but turn out to be poor choices *ex post*, but it may not serve us much to refer to all such instances as “mistakes.” For example, it is *ex ante* reasonable to purchase an adjustable-rate mortgage (“ARM”) offering a lower interest rate instead of a fixed-rate mortgage (“FRM”) if you believe the rate will stay low; if the rate spikes up towards the end of the loan term, it turns out to have been an unfortunate choice *ex post*. Likewise, if you have no plans to move, it is *ex ante* reasonable to secure a lower rate by agreeing to a prepayment penalty; if you unexpectedly lose your job next year and must relocate, it is a regrettable choice *ex post*. But these unfortunate decisions are just part of life: they still indicate rational decision-making. In this Article, we are only interested in consumers’ mistakes insofar as they are *apparently* irrational. By this we mean that, from a sophisticated and informed party’s perspective, the consumer could be doing much better but is not opting to do so.

Such apparently irrational choices can occur either in choosing a product or after having chosen one. This distinction is important because addressing them, we argue, requires different strategies.

### A. *Heuristic Differences*

Our first claim is that product-choice mistakes and failure-to-switch mistakes are heuristically distinct. In other words, the problems consumers must solve to make optimal decisions in the two instances are fundamentally different.

A product-choice mistake can occur when a consumer seeks a new financing arrangement; either original financing or refinancing. The consumer may be looking to buy a house or a car. The favorable market condition has convinced him to refinance. In these cases, the central question is:

Given that (i) I must finance my debt, (ii) various products offer competing benefits and costs, and (iii) there is uncertainty as to which particular future state in which I will end up, which product is optimal for me for the foreseeable course of my debt?

Product-choice mistakes concern ex ante efficiency: some consumers are choosing *probabilistically* and *foreseeably* inferior products, as compared to other readily available options. To be sure, all ex ante efficiency mistakes will *affect* ex post welfare: poor product choices adversely affect future repayment obligations and economic welfare. But if this was largely predictable—for example, by a sophisticated predatory lender—it represents an ex ante efficiency mistake.

Failure-to-switch mistakes, by contrast, concern ex post welfare improvement, given an unanticipated market shock.<sup>29</sup> It is a mistake if consumers, for no apparent reason, forego available refinancing options that are *certain* to increase wealth substantially. The failure-to-switch problem focuses on the following question:

Is there an alternate financing option that is unambiguously superior to my current terms under all realistic future states (e.g., given my spending pattern or plans to stay) and accounting for all pertinent transaction costs?

The product-choice problem usually cannot afford this simple question. The consumer's difficult choice is seldom between two products, where one is unambiguously superior to the other. His mistakes are along the line of focusing on short-term costs versus long-term costs, or having unreasonably optimistic expectation of his future state—factors which render product comparison more ambiguous. But if the interest rate declines substantially, the consumer may indeed find a refinancing arrangement that is, for all intents and purposes, unambiguously welfare-improving.<sup>30</sup>

There are further heuristic differences. Failure-to-switch mistakes concern timely *refinancing*, which is not always *required* of consumers. If consumers find it too taxing to search, they may not even look for opportunities. Product-choice mistakes, by contrast, are more likely to be exogenously triggered, such as one's desire or need to purchase a house or relocate. Put differently, the opportunity cost of not engaging in a search is different for the two problems: one who does not search for refinancing options foregoes a probabilistic saving of an *uncertain* amount that may or

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29. To be more accurate, failure-to-switch mistakes concern ex post welfare improvement with respect to the realized rate decline. However, they also involve some ex ante efficiency concerns, such as the possibility of moving in the future, which may affect the profitability of refinancing.

30. It is also possible that the consumer will decide to refinance and choose a product that is *not* unambiguously better, but still superior in expectation—e.g., refinancing from a fixed-rate mortgage to an adjustable-rate mortgage. In this case, the problem again will reduce to either a reasonable mistake or a product-choice mistake, rather than a failure-to-switch mistake.

may not be out there; by contrast, one who does not search for original financing options cannot buy a house.

Second and relatedly, the fixed costs involved—such as search and closing costs—can be a significant barrier both economically and psychologically in refinancing. This is different with original financing: it is far less likely that the consumer will be discouraged to buy a house because the purchase entails title insurance fees and appraisal fees.<sup>31</sup>

Third, for those motivated to switch, timing is a more independent variable of choice than in original financing. This is critical because it indicates reasonable mistakes can occur on both sides: some may refinance too soon, and others may wait too long. Although timing can also play a role in home purchase decisions, product-choice mistakes still take place in a fixed moment in time—the mistake is choosing the wrong product among all the products available at a certain period.

Finally, the calculus of loan comparison is also different for these two problems. The product-choice problem often admits an item-by-item comparison of comparable terms among competing loans—such as lender commissions, points, or APRs, etc. In refinancing, the benchmark of comparison is the existing mortgage, and the consumer needs to compare in essence the APR of a new loan against the going-forward APR of his partially-amortized loan to understand the cost saving.

Table 1 summarizes the foregoing points.<sup>32</sup>

*Table 1. Heuristic Differences Between Product-Choice Mistakes and Failure-to-Switch Mistakes*

<i>PROBLEMS</i>	<i>PRODUCT-CHOICE</i>	<i>FAILURE-TO-SWITCH</i>
<i>Relevant Inquiry</i>	Expected utility maximization based among products presenting different welfare outcomes in different future states	Unambiguous welfare improvements in all realistic future states due to declined interest rate
<i>Search Trigger</i>	Exogenous needs	Not always present
<i>Timing</i>	Exogenously determined	Endogenously determined
<i>Fixed Cost</i>	Marginal deterrent effect (or	Significant deterrent effect

31. Similarly, fixed costs are no longer relevant to those who already made up their minds to refinance.

32. There is also a practical difference between the product-choice problem and the failure-to-switch problem. In original financing, the consumer can usually seek advice from his or her realtor, who likely has an existing long-term relationship with a broker or a lender and can also make a general recommendation of a suitable mortgage product. In the case of refinancing, the consumer usually does not have any intermediary who can provide such advice or helpful contact.

	irrelevant)	
<i>Calculus of Comparison</i>	Possible to make an item-by-item comparison, or compare the disclosed APRs	Comparison between going-forward loan obligation of the incumbent loan against a brand new loan term with multiple items

In terms of proposals for addressing consumer mistakes, a number of suggestions exist for addressing product-choice mistakes. Dodd-Frank disallows many forms of mortgages, such as balloon payments or prepayment penalties in high-cost mortgages.<sup>33</sup> The Bureau is considering a new mortgage disclosure requirement by seeking input from consumers.<sup>34</sup> Barr, Mullainathan, and Shafir recommend a sticky opt-out policy whereby consumers must first be offered a standardized thirty-year, fixed-rate mortgage and can switch out to alternative forms, but at certain costs.<sup>35</sup>

None of these measures are specifically intended to address failure-to-switch mistakes. Nor do we believe any of these measures will be particularly effective in addressing them. At best, more effective disclosure regulation can help consumers compare across various available products. Before we recommend a solution, however, it will serve us well to understand possible underlying causes as to why some borrowers fail to switch efficiently.

#### B. *Shared Underlying Causes*

It has become a favorite pastime among economists to rationalize, or otherwise theorize, apparently irrational consumer behavior. The literature is now vast, and it is not our intention to provide a comprehensive review here.<sup>36</sup> Our aim is to tell a brief, overall story about the market. The first step of studying consumer mistakes is to understand why they *arise*: this is where the literature can rely on models to rationalize observed behavior. The second step is to understand why they *persist*: this is trying to understand why market forces by themselves will not solve the problem. In this section, we review the traditional justifications which rationalize the

33. Dodd-Frank Wall Street Reform and Consumer Protection Act, Pub. L. No. 111-203, § 1021 (2010).

34. Abby Gregory, *CFPB's New Mortgage Disclosure Initiatives Gaining Traction*, THE M REPORT (Sept. 30, 2011), available at <http://www.themreport.com/articles/cfpbs-new-mortgage-disclosure-initiatives-gaining-traction-2011-09-30>.

35. See Michael S. Barr et al., *supra* note 6 (arguing for an opt-out mortgage policy).

36. For an excellent survey article, see Bar-Gill & Warren, *supra* note 7 (introducing the case for comprehensive consumer financial protection regulation).

occurrences and persistence of product-choice mistakes—of which much has been written. We then turn to see whether those justifications can explain the persistence of failure-to-switch mistakes—of which very little has been written.

### 1. Product-Choice Mistakes

According to the neoclassical framework, a rational, informed consumer who can reasonably predict his future state will use a credit arrangement to borrow money if and only if the net present value of the expected benefit of borrowing exceeds the net present value of the expected cost. Here, the economic cost includes interest-rate costs, potential penalty fees, and potential costs related to bankruptcy and/or foreclosure. The rational-actor model predicts that every transaction should be (at least, statistically) *ex ante* welfare-enhancing. Economists have since sought to modify certain assumptions to reconcile the model with the fact that a significant segment of consumers appear to make product-choice mistakes consistently.

There are two prominent modifications: either the average consumer makes his borrowing decision without being fully informed, or he is given full information but is unable to properly calculate the total cost of borrowing.<sup>37</sup> In this Article, we loosely refer to these stories as *lack of information* and *lack of expertise*. Either way, we can say the market is “obfuscated” in the following sense: regardless of any specific intent among market participants, the equilibrium condition is such that the market is not allowing the unsophisticated consumer to fully appreciate the

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37. Another usual modification used to explain consumer behavior in the credit market is hyperbolic discounting, which has mostly been used to model two particular patterns of behavior: (i) impulsive spending (more precisely, the consumer’s inability to commit his future self to not spend), and (ii) myopia (or, optimization over short-term costs rather than full costs). With regard to impulsive spending, we view this modification as being more relevant to credit card usage rather than mortgage product choices. Credit card debt deals with continuous spending, rather than a fixed sum. See, e.g., Stefano Della Vigna & Ulrike Malmendier, *Contract Design and Self Control: Theory and Evidence*, 119 Q. J. ECON. 353, 393–94 (2004) (exploring contract design in the credit market). The use of hyperbolic discounting in analyzing product choices has not been as prominent except insofar as it can imply myopia. But see Andra C. Ghent, *Subprime Mortgages, Mortgage Choice, and Hyperbolic Discounting* (Working Paper, 2011), available at <http://aux.zicklin.baruch.cuny.edu/ghent/research/SubprimeandHyperbolic.pdf> (using hyperbolic discounting to explore the “implications of offering households the choice between traditional fully-amortizing mortgages that require substantial down payments . . . and mortgages that involve lower initial payments. In this Article, however, we have chosen to treat myopia as a form of lack of expertise (e.g., inability to fully internalize deferred costs), and have chosen not to treat hyperbolic discounting as a separate modification.

total wealth and risk effects of choosing a given mortgage product. Although plausible, these two stories are incomplete until we can explain why the market permits these problems.

*a. Lack of Information.*

The lack-of-information story simply posits that lenders withhold key information about products' suitability and thereby extract information rent from borrowers. For example, a borrower may sign up for a fixed-rate mortgage featuring a substantial prepayment penalty, of which he is unaware, and may bear the consequence later on. This story begs the question as to why lenders are not then competing on the basis of disclosing such information.

Several answers have been given. First, there may be a *freeriding* or *collective action* problem among lenders. As Bar-Gill and Warren explain, many products share the same feature in this relatively-standardized market. Consequently, a lender may engage in costly advertising to inform consumers of a certain hidden feature that other lenders may be using to extract rent from their consumers, and design and market a product without such disadvantageous feature. He may then win over consumers initially, but other lenders may follow suit and likewise eliminate such feature, and they will eventually compete away all the profits. Anticipating this, the original lender will choose not to compete along this dimension, and the market equilibrium prevents the disclosing competitor from winning over consumers.<sup>38</sup>

Second, there may be *imperfect competition* due to the transaction cost of identifying and reaching relevant potential consumers. For example, the incumbent lender has an informational advantage over competitors regarding his consumer's creditworthiness. In the case of predatory mortgage refinancing,<sup>39</sup> the incumbent lender can use this advantage to make a particular loan offer that is tailored for the consumer to default, while earning greater interest payments up until the point of default.<sup>40</sup>

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38. See Bar-Gill & Warren, *supra* note 7, at n.30 and accompanying text.

39. See Philip Bond, et al., *Predatory Mortgage Lending*, 94 J. FIN. ECON. 412, 412 (2009) (finding that "predatory lending is associated with highly collateralized loans, inefficient refinancing of subprime loans, lending without due regard to ability to pay, prepayment penalties, balloon payments, and poorly informed borrowers").

40. *Id.* at 413. Bond provides two scenarios of predatory lending. First, the lender may offer a refinancing option to a homeowner facing foreclosure, to extract more payments, even as foreclosure remains unavoidable under the new arrangement. Second, the lender may provide a cash-out refinancing to a homeowner who is otherwise in the path to completing his mortgage, so as to bring about foreclosure.

Third, there may be instances of *ineffective competitor advertising*, also known as the “curse of debiasing.”<sup>41</sup> According to one theory, a competing vendor may not be incentivized either to disclose or to engage in a negative advertisement for other vendors, if such disclosure would not actually result in informed consumers switching over but simply result in the consumers’ taking self-help measures—such as devising ways to make sure they do not fall victim to certain adverse features—to improve their welfare.

Note also that if market conditions allow for less-than-full disclosure on the part of lenders, a natural corollary is that even when lenders are mandated to disclose information, they would choose to do so in a format consumers cannot easily process. If consumers are rational but they incur high information processing costs, then the same story can also explain why lenders may not compete to disclose information in a more consumer-friendly manner.

*b. Lack of Expertise.*

The second story rationalizes how a group of consumers may subscribe to welfare-reducing credit arrangements even under perfect competition. This is explained by a *lack of expertise by a select group of the population*—usually the undereducated and the poor. Naïve consumers may myopically focus on short-term costs while sophisticated consumers know how to minimize long-term costs.<sup>42</sup> Firms can then offer low initial costs and exorbitant long-term costs or add-on prices, such as through products featuring hidden fees and teaser rates. Indeed, deferred payments are a common feature in many mortgage products. Negative amortization and interest-only mortgages, which grew in prevalence prior to the crisis, likewise feature low teaser rates which increase after a pre-set period. A similar division may also occur when borrowers are given the option of paying points to reduce interest rates and myopically focused consumers forego this opportunity. Under competition, the eventual effect here is a cross-subsidization of sophisticated consumers by naïve consumers who lack the expertise to evaluate credit arrangements.

One reason why the lack of expertise can persist is because there may be *insufficient incentives for the market to educate consumers*. Sellers can

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41. See Xavier Gabaix & David Laibson, *Shrouded Attributes, Consumer Myopia, and Information Suppression in Competitive Markets*, 121 Q. J. ECON. 505, 507–09 (2006) (providing the example that a fraction of consumers who learn about hidden attributes still prefer to stay with the incumbent vendor and take measures to minimize those hidden costs, while uninformed consumers continue to pay for the hidden costs).

42. *Id.*

usually take better advantage of naïve consumers. Competitors may be unwilling to educate these naïve consumers because once they learn to estimate the true costs, they may be able to find means to reduce the costs themselves, rather than switching over to the competitor who chose to disclose everything.<sup>43</sup> As Gabaix and Laibson argue that “[n]ewly educated consumers (i.e., sophisticates) are not profitable to any firm.”<sup>44</sup> Therefore, at equilibrium, the information revealed may be insufficient to promote full transparency and simplicity.

## 2. Failure-to-Switch Mistakes

Unlike product-choice mistakes, economic rationalization of failure-to-switch mistakes in the mortgage market has been sparse.<sup>45</sup> In this Part, we seek to understand why failure-to-switch mistakes arise by applying the insights from recent advances in microeconomic theory of product search. We then turn to understand why they persist by applying the lessons we have learned about this market from product-choice mistakes.

We again begin with a neoclassical benchmark. First, the *switching* problem: given a new loan offer, a rational consumer under a payment obligation will switch if the net present value of the cost under the new arrangement plus the cost of switching is lower than that under the existing arrangement and if he does not expect a greater saving from waiting. As stated, this is a complex problem involving a closed form of optimal refinancing, which can only be solved if one makes certain assumptions

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43. *Id.*

44. *Id.* at 520.

45. For sluggish patterns in credit card switching, however, three different explanations have been put forth. First, consumers may be reluctant to switch if they irrationally believe that they will pay off the existing debt a lot sooner than can be reasonably expected. Lawrence M. Ausubel, *The Failure of Competition in the Credit Card Market*, 81 AMER. ECON. REV. 50, 71–72 (1991). Second, credit card borrowing may be inversely correlated with a household’s willingness to search and shop for best available financing schemes—meaning, households with larger balances have greater disutility of search. Paul S. Calem & Loretta J. Mester, *Consumer Behavior and the Stickiness of Credit-Card Interest Rates*, 85 AMER. ECON. REV. 1327, 1330–33 (1995). *But see* Paul S. Calem et al., *Switching Costs and Adverse Selection in the Market for Credit Cards: New Evidence*, 30 J. BANKING & FIN. 1653, 1655–60 (2006) (refuting Calem & Mester’s 1995 argument with later data). Third, the magnitude of the switching cost may be stochastically realized, in that the disutility of switching depends on the consumer’s busy schedule and other conditions, including their emotional state, at the time of receiving solicitation, all of which cannot be perfectly predicted. Therefore, consumers systematically underestimate the switching costs at the time of signing up for an initial card and once switching costs are realized they are unable to take action. Haiyan Shui & Lawrence M. Ausubel, *Time Inconsistency in the Credit Card Market* (Working Paper, January 30, 2005), available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=586622](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=586622).

about the movement of interest rate.<sup>46</sup> We need not actually solve this problem for our discussion. We can simplify it by requiring only that the net present value of the cost under the new arrangement is substantially lower than that under the existing arrangement.<sup>47</sup> Our modest focus is helping consumers take advantage of clearly and substantially wealth-enhancing opportunities where present. In addition, a regulatory success in this domain can be measured without having to solve the optimal refinancing problem: we can indirectly measure it by looking at the extent to which the systematic refinancing gap that currently exists between sophisticated households and unsophisticated households is reduced. This will reveal whether regulation is helping unsophisticated households mimic the behavior of sophisticated households.

This switching problem in turn informs the consumer's *search* problem. According to Stigler's theory of search, a consumer in possession of an offer will not search for a new product if his marginal cost of search is greater than the expected benefit, *given* his understanding about the distribution of prices out there.<sup>48</sup> Applying this insight, we assume that the consumer under an obligation to make certain mortgage payments receives signals about the distribution of available products from advertisements and direct solicitation. If the signals perfectly correlate with the actual distribution, there is no reason *a priori* to expect a statistically significant deviation from the normative theory's prediction.

Suppose on the other hand that lenders cannot credibly communicate the offer terms, and therefore the consumer believes that a signal only poorly indicates a particular offer. The consumer must make a costly investment to understand the actual terms, which may be much less attractive.

We model this as follows. At the beginning of each period the consumer receives a signal or a series of signals regarding available products. The signals convey some information regarding the distribution of available products. The consumer then decides whether to engage in the costly search. Given a signal  $\sigma$  of the interest rate, let the actual effective interest rate of the product be uniformly distributed between  $[\sigma, \sigma + \varepsilon]$ .  $\varepsilon$  is the level of market obfuscation: the signal is perfect when  $\varepsilon = 0$ . The

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46. See, e.g., Sumit Agarwal et al., *Optimal Mortgage Refinancing: A Closed Form Solution* (Working Paper, 2008), available at <http://www.economics.harvard.edu/faculty/laibson/files/Mortgage%20refinancing.pdf> (deriving a closed-form optimal refinancing rule).

47. A usual metric used by mortgage brokers is to match the two values and use that as the threshold. *Id.* at 26.

48. George J. Stigler, *The Economics of Information*, 69 J. POL. ECON. 213, 218–19 (1961).

consumer is aware of  $\varepsilon$  and must incur a search cost of  $s(\varepsilon) = K\varepsilon^2$  to fully verify the offer, where  $K > 0$ . This functional form of the search cost is chosen to satisfy three conditions: the search cost is (i) zero when  $\varepsilon = 0$ , (ii) increasing in  $\varepsilon$ , and (iii) is strictly convex in the level of obfuscation.<sup>49</sup>

Under the set up, we have the following Proposition, which we prove in the Appendix:

**Proposition 1 (Failure-to-Switch Mistakes).** Suppose lenders cannot credibly convey the true interest rate and there is a uniformly-distributed obfuscation in the market. If the consumer must incur a search cost to understand the terms of the product, strictly convex on the level of obfuscation, then we will observe sluggish refinancing behaviors in the form of consumers' failures to make timely refinancing switches. In addition, as empirically observed, the lag will be increasing in the level of obfuscation and the personal search cost coefficient, and decreasing in the principal remaining.

One way to interpret this proposition is that consumers, especially unsophisticated consumers, facing high search and processing costs, demand a premium in signal decline before searching into given product offers. This is empirically consistent with Fuster and Willen's finding that search activity for refinance loans is lower among low credit score borrowers.<sup>50</sup> The intuition is similar to the idea that information asymmetry

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49. The assumption of a strict convex search cost is consistent with the literature. For example, Ellison & Wolitzky also use a strictly convex search cost depending on time spent on searching, which increases with the level of obfuscation. *See, e.g.*, Glenn Ellison & Alexander Wolitzky, "A Search Cost Model of Obfuscation" (Working Paper No. 15237, 2008), available at <http://econ-www.mit.edu/files/3202> (assuming a strictly convex search cost depending on the level of obfuscation). They explain specifically that "banks can be thought of as practicing obfuscation when they fail to post complete lists of their account fees in a prominent location." *Id.* at 11. Likewise, lenders can be thought of as practicing obfuscation when they do not clearly present the effective costs of borrowing. One difference is that we interpret the spread of the available interest rates as indicating the level of obfuscation. Alternatively, we might assume that each offer entails a different search cost, where the search cost depends not on the spread of available products, but instead on the actual spread of the given product to its signal—meaning the higher the effective rate of the product, the greater the search cost to understand the terms because there is so much hidden information to process. Such a set-up would not change the model because in this case we can work with the consumer's expectation of the search cost, which again becomes a quadratic function. In this case, the expected search cost of a given offer is the integral of  $K\varepsilon^2$  from 0 to  $\varepsilon$ , divided by  $\varepsilon$ . This turns out to be  $K\varepsilon^2/3$ .

50. Andreas Fuster & Paul S. Willen, *\$1.25 Trillion Is Still Real Money: Some Facts About the Effects of the Federal Reserve's Mortgage Market Investments*, 21–23 (Fed. Reserve Bd. of Bos., Working Paper No. 10–4, 2010), available at <http://www.bos.frb.org/economic/ppdp/2010/ppdp1004.pdf>. The authors, however, attribute the relatively low search activity among low-credit borrowers on the additional fees these borrowers must bear. *Id.* at 4.

in trading stocks can result in bid-ask spreads because uninformed investors tend to worry about the possibility of trading with better-informed investors. This is a form of rational market non-participation in the refinancing market among those who have chosen to take out mortgages for exogenous reasons. Alternatively, we can also analogize this lag to instances of price dispersion that can exist under competition when consumers must incur high search costs.<sup>51</sup> In this sense, failure-to-switch mistakes are not really mistakes in actuality, but a manifestation of consumers' rational responses to their lack of sophistication.

Although the search cost and the lack of communication mechanism will slow down refinancing in the declining market, the search cost that can justify the amount of lag observed would have to be significant. One reason for this lag may be that the consumer only gets a probabilistic sense of the comparative value of the new loan after the initial search. For example, the consumer may feel like he can understand the terms of the new loan sufficiently after one reading to conclude with fifty percent confidence that this is indeed a better deal for him, but he is not actually sure. His confidence level may increase up to seventy-five percent after three readings. It may be that he has to devote a substantial resource to actually conclude definitively that the new loan terms are better.

Alternatively, to the extent the search takes place after the consumer has already decided to engage in search, what matters in terms of the consumer's decision is the *perceived* search cost, not the actual. Someone who has refinanced once before will have a better sense than one who has never refinanced of the actual search cost involved. Indeed, demographically, those exhibiting a lag are indeed younger borrowers, who as a group are less likely to have refinanced previously.

Proposition 1 may explain why in practice those who are slow to refinance optimally tend to be more prevalent among less educated, poorer, and minority consumers. Consistent also with Proposition 1 is Campbell's observation that "[h]igh mortgage rates tended to be paid on slightly smaller mortgages, so the shares of mortgage value that paid high rates were somewhat lower . . . ."<sup>52</sup>

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51. Campbell, *Consumer Financial Protection*, *supra* note 1, at 93 (explaining how "price dispersion . . . can be sustained by the existence of search costs that make some consumers willing to pay higher prices than they might find elsewhere"). In Ellison & Wolitzky's article, they assume that a fraction  $\mu$  of the consumers can search costlessly, while  $1 - \mu$  of them face search costs. They summarize this type of market condition as follows: "There is a more natural search problem when price dispersion is present, and price dispersion will exist in equilibrium when consumers are differentially informed." Ellison & Wolitzky, *supra* note 49, at 1.

52. Campbell, *Household Finance*, *supra* note 13, at 1579.

In the remainder of this section, we explore how market obfuscation may arise in practice and why the market would allow it.

*a. Lack of Information.*

Our result on refinancing activity can be interpreted as stating that consumers who are in a position to refinance make their decision of *whether* to refinance based on an insufficient set of information, because the full economic ramification of refinancing is not clearly or credibly presented.

We advance three interpretations as to how lenders and brokers can fail to credibly communicate their offers in practice. First, consumers may mistrust the available information.<sup>53</sup> In any market, consumers must distinguish good products from bad products. The rise of the Internet and the development of related technologies are often thought to have greatly reduced consumers' search costs; unfortunately, the opposite may be true as well. The difficulty with searching for products today is not the absence of products but rather a surplus of them. There have also been frequent instances of predatory refinancing and consumer fraud. Our tendency to product advertisement that guarantees great savings is one of skepticism, rather than enthusiasm. Lenders offering genuinely opportune deals may find it difficult to reach consumers in a credible, certifiable manner.<sup>54</sup>

Second, mortgage contracts may contain too many add-on costs. For example, a mortgage product comes advertised as a four percent product. But upon closer inspection, it may be that the terms contain too many add-on costs—such as additional fees and late payment penalties, etc.—so that the effective interest cost to the buyer is more like six percent. With all these add-on costs, lenders cannot credibly convey the effective interest costs of the mortgage. Add-on costs, however, should not be interpreted solely as lenders' intent to defraud helpless consumers. Where products are relatively standardized but also customized on the margin, it may be that buyers come in so many different types that lenders have no choice but to offer a standard product equipped with add-on elements that are narrowly tailored for each consumer's needs. In this case, it would not

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53. See, e.g., Campbell, *Consumer Financial Protection*, *supra* note 1, at 93 ("Even with disclosure rules in place, lack of trust is a problem that may lead consumers to avoid the use of certain financial products altogether . . .").

54. For example, as of September 2011, when the interest rate reached a historic low, a study conducted by LendingTree.com revealed that even though "[r]efinancing is something that is going to be saving [the consumers] hundreds of dollars a month and yet the first three emotions consumers said they feel when they think about it were anxiety, nervousness and overwhelmed." Jaffe, *supra* note 25.

necessarily be cost-effective for lenders to advertise each product's distinct feature effectively.

Third and relatedly, lenders and brokers may all be genuine in their offers but may simply choose to employ different advertisement strategies. Some may provide zero-closing cost financing options because they want to appeal to consumers who are otherwise deterred by fixed costs. Others may advertise lower interest rates, but with hidden add-on costs. Lenders and brokers may also vary in terms of transparency as well. Some may want to entice consumers first and then explain the add-on costs; others may believe reputation matters and thus they want to be upfront from the outset about all possible costs. It is possible that this heterogeneous strategy among lenders represents equilibrium.<sup>55</sup> If this is the case, consumers may need to incur search costs to distinguish the offers and their strategic advertisements.

For these reasons, consumers may rationally forego making the costly investment to search into a product even when the offer seems reasonable. But as the market's interest rate declines further still, and consumers receive better offers, they may perceive a higher probability of actual saving and eventually be convinced of the legitimacy of such cost-saving products.

Meanwhile, a general story based on the search cost, the lack of credible communication mechanism, and resulting consumer inertia or mistrust still does not explain why the market cannot *overcome* it. For example, why do competing lenders not disclose the terms in simpler manner to let consumers understand the sheer magnitude of their failure-to-switch mistakes?

One likely reason is that lenders face a *collective action problem*, and as a result, they may fail to develop a clear and transparent communication mechanism. Insofar as a mechanism that can benefit one lender can likewise benefit all other lenders, no one lender has sufficient incentive to develop it. More importantly, even if one lender were to develop a mechanism, it still remains costly—and possibly prohibitively so—for the lender to convince consumers of its value.

Secondly, as with the story of predatory refinancing with incumbent lender in product-choice mistakes, competing lenders may lack access to information about the consumer's existing loan to make a suitably enticing and well-tailored refinancing offer in simple terms. Therefore, competition

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55. See Glenn Ellison & Sara Fisher Ellison, *Search, Obfuscation, and Price Elasticities on the Internet*, 77 *ECONOMETRICA* 427, 429 (2009) ("Price search engines and other Internet tools will help consumers to find and to process information, but retailers may simultaneously harness the power of the Internet to make information processing problems more formidable and/or to make consumer informedness less damaging to their profits.").

is imperfect, and lenders cannot present terms of the comparative benefit in an easily understood format. Although this is likely to be true to some extent, we expect these problems to dissipate over time as information-sharing becomes more common in the future, for instance, through third-party vendors that allow data-sharing.

Even from the supplier side of the story, however, it is not entirely clear whether lenders or brokers have sufficient incentive to invest in establishing a credible communication mechanism. There may be several reasons for which lenders and brokers may not much care to compete for sluggish refinancers.<sup>56</sup> In what follows we try to analyze the incentive structure of lenders and brokers. For now, we assume lenders do not securitize and sell their loans, but instead earn continuous profits from the interest payments consumers make. We relax this assumption later.

Consider two lenders: say, Bank of America and Citibank. To begin with, note that Bank of America under our assumption almost certainly has no interest in letting its own customers know about low available rates, given that it is earning profits from sluggish refinancers' interest payments. As a result, the incentive to capture sluggish refinancers is more likely to originate from other lenders. But here we potentially have an *ineffective competitor advertising* scenario. It may not serve Bank of America much to make a credible and transparent offer to remind Citibank's borrowers that they are foregoing great refinancing opportunities. This is a market for standardized goods. Most likely, Citibank's borrowers can simply go to Citibank and ask it to match Bank of America's offer, which banks frequently do honor. Citibank would prefer to reduce the rate than to lose its customers. At the end of the day, Bank of America's enticement would only help a Citibank customer's welfare without having him switch over to Bank of America. Anticipating this, Bank of America may not want to bother exerting any costly effort to entice incumbent borrowers of other lenders. This is consistent with Gabaix and Laibson's theory of how certain product attributes may remain shrouded even under competition.<sup>57</sup> Therefore, there is likely a suboptimal level of effort among competing lenders to inform the current credit borrowers of new cost-saving products.

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56. In this section, we make a simplification and treat all lenders as those who stand to earn revenues from borrowers' interest payments and brokers as those who earn fixed commissions from originating loans. In reality, banks frequently securitize their loans and sell them off as mortgage-backed securities. Banks come in two types: (i) large banks that do in fact keep some of their loans without securitizing, and (ii) mortgage banks that securitize nearly all of their loans. We believe the incentive structures for these banks fall in the spectrum of pure lenders and pure brokers, and are thus sufficiently captured by our analyses.

57. See *supra* note 46 and accompanying text.

There also exists a potential *lender collusion equilibrium* because neither Bank of America nor Citibank actually wants to see sluggish refinancers eradicated from the market altogether. Banks earn positive interest profits from consumers who fail to switch out promptly. Therefore, although Bank of America may try to steal Citibank's customers by offering a rate Citibank is unwilling to match, the same strategy may be used against Bank of America by Citibank in the next period. The end result may be that both Bank of America and Citibank just sabotage their own future profits for good. Anticipating this, Bank of America would not bother undercutting Citibank. In short, while lenders may compete vigorously for all consumers who approach them, they may otherwise have no incentive to compete for existing consumers of other lenders. In the Appendix, we establish the conditions for successful lender collusion, as noted in the following Proposition:

Proposition 2 (Lender Collusion Equilibrium). Suppose the following three conditions hold: (i) lenders do not discount the future too much, (ii) lenders expect interest rates will continue to decline, and (iii) there is a positive fraction of population that is ignorant of interest rate changes, or otherwise insensitive to interest rate changes, unless specially made aware of those changes (as in Proposition 1). Then a Nash equilibrium exists in an infinitely repeated game under which lenders will continue to compete for new borrowers, but will not make special effort—even if it's costless—to entice their competitors' existing borrowers by undercutting the interest rates.

Strengthening this result is the more general finding that players in a repeated game may not even need any intent to collude for the collusion equilibrium to be maintained. Paul Klemperer established that in multi-period markets with consumer switching costs—such as the mortgage market—the non-cooperative, competitive equilibrium can be the same as the collusive outcome in an otherwise identical market without switching costs.<sup>58</sup>

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58. Paul Klemperer, *Markets with Consumer Switching Costs*, 102 Q. J. ECON. 375, 375–76 (1987); see also Paul Klemperer, *The Competitiveness of Markets with Consumer Switching Costs*, 18 RAND J. ECON. 138, 139 (1987) (analyzing how switching costs affect the competitiveness of markets).

*b. Lack of Expertise*

Consistent with the lack-of-expertise story for product-choice mistakes, it is also possible that less sophisticated consumers may tend to focus myopically on short-term costs, and are unable to fully internalize the long-term economic benefits of refinancing. They may be inefficient in managing their mortgage products because the prospect of the closing cost may discourage them from refinancing optimally. Even outside the mortgage market, many experimental studies involving consumers and search-and-switching costs have found that consumers tend to wait too long to switch,<sup>59</sup> as compared to what the normative theory would predict.

This problem is unlikely to persist if lenders or other market participants can effectively educate consumers to internalize long-term economic effects of refinancing when the interest rate is sufficiently low. But in this market, competing mortgage lenders' incentive to educate the unsophisticated borrowers is compromised by the fact that once consumers truly learn to manage their mortgages well, they can easily switch out of the new products when the rate declines still further. Here again, we have a situation where newly educated consumers are not profitable to any firm.

More generally, it seems that in a market where consumers have the option to switch in and out of products, sellers will lack incentive to educate consumers to make right switches out of the concern that they will lose future profit streams. As a result, the refinancing market is characterized by "comparison friction," whereby the information necessary to make transactional decisions may ultimately be available to customers, but sellers deliberately present them in a suppressed manner.<sup>60</sup>

Let us next consider the incentive structure of brokers. The fact that competition among lenders may not solve the problem of market obfuscation, of course, does not necessarily indicate that competition among brokers cannot solve this problem. Even as lenders may indeed not compete for slow refiners, brokers or other loan originating officers may want to approach incumbent borrowers because their revenue models are different from lenders: they often earn fixed commissions for extending and consummating loans. This may explain why the letters we

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59. See, e.g., John D. Cripps & Robert J. Meyer, *Heuristics and Biases in timing the Replacement of Durable Products*, 21 J. CONSUMER RES. 304, 312 (1994) (finding that consumers tend to display a bias against replacing deteriorated products); Gal Zauberman, *The Intertemporal Dynamics of Consumer Lock-In*, 30 J. CONSUMER RES. 405, 414–16 (2003) (finding that consumers have a decreased propensity to search and switch after an initial investment).

60. Jeffrey R. Kling et al., *Comparison Friction: Experimental Evidence from Medicare Drug Plans* (Working Paper No. 17410, 2011), available at <http://www.nber.org/~kling/choosing.pdf>.

receive on refinancing options are rarely from respectable banks but more likely from little-known mortgage brokers. However, it is one thing to ask whether brokers may find it profitable to originate loans to sluggish refinancers—the answer to this narrow question is undoubtedly *yes*. It is quite another to ask whether a fully transparent, credible communication method would be profit-maximizing for brokers and, in addition, whether they would be sufficiently incentivized to capture sluggish refinancers while interest rates are declining. The answers to these latter questions are, we submit, at least debatable for the following reasons.

First of all, transparency is a double-edged sword. On the one hand, having a transparent communication mechanism may help brokers secure slow refinancers who clearly stand to benefit substantially; on the other hand, having such mechanism may bring about a loss of other refinancers who unknowingly sign up for products that are not *ex ante* welfare-enhancing. For example, this would be the case with predatory refinancing. Brokers may be unwilling to win over sluggish consumers and risk losing other naïve and possibly misled consumers.

Second, a transparent mechanism will almost certainly be disadvantageous for brokers when the interest rate is increasing and the market offers innovative, risky products to work around the high interest rate. At an individual broker level, a consumption smoothing argument may discourage brokers from introducing transparency in the market. Another way to tell this story is that, at the aggregate level, there is a relatively inelastic supply of brokers initially, and they all come with a finite supply of time. When the interest rate is declining, brokers naturally become so busy with all the demand for refinancing among efficient, sophisticated refinancers that they may not be sufficiently incentivized to capture sluggish refinancers. For this reason, even for brokers, their private optimal level of obfuscation is unlikely to be zero.

So far, we have given a story as to why lenders who are assumed to make continuous profits from interest payments may not be incentivized to promote transparency in the refinancing market. We have also given a story as to why brokers earning fixed commissions for loan consummation may similarly not be incentivized to promote transparency. In practice, many banks do not keep their loans, but securitize them and sell them off. The precise extent will depend on each bank's business model: some sell nearly all their loans; others keep a significant portion of them. Without going into the detailed pricing methods for securitized loans, we note only that the incentives of these banks who securitize and sell a portion of their loans are likely to be captured roughly as a linear combination of the incentives of the above two entities, neither of which is fully incentivized to promote transparency. Consequently, we believe the capital market

structure of mortgage lenders does not significantly affect the result of our analysis.

Nevertheless, given that there is an opportunity for efficiency gain in helping sluggish refinancers, we do not completely rule out the possibility that a well-established, reputable, and long-term-oriented company with other profit sources may jump in and help consumers refinance more efficiently. Our main point is only that the market forces currently existing among brokers and lenders seem insufficient to educate consumers or otherwise lift obfuscation to stimulate efficient refinancing.

On a broader note, our contention is that product-choice mistakes and failure-to-switch mistakes largely share the same set of underlying causes. As we have seen, these include collective action problems, imperfect competition due to information costs, lack of conditions in the market for full information disclosure, and lack of incentives for the market participants to educate consumers optimally. Taken together, all of these conditions allow the market to remain sufficiently obfuscated for unsophisticated consumers. In this sense, we view product-choice mistakes and failure-to-switch mistakes as causally equivalent—as different manifestations of the same set of underlying market failures.

### C. REGULATORY OBJECTIVES AND ECONOMIC CONSEQUENCES

The foregoing discussions sought to rationalize failure-to-switch mistakes among consumers lacking financial sophistication, and explored possible reasons why the market left to its own may not fix this problem. As it turns out, product-choice mistakes and failure-to-switch mistakes are not only causally analogous, but also *consequentially* analogous: with both types of mistakes, market obfuscation allows lenders to extract greater interest costs from unsophisticated consumers than they are able to internalize.

As a general matter, when a market is characterized by search-and-switch costs for consumers, firms are able to earn profits even under competition. This is because a consumer seeking to switch out of a particular product—either for its low quality or a high price—must incur a search-and-switch cost before he can consume a different good. It is also true that where consumers are not fully rational, the consumer credit industry may consistently earn rents despite competition.<sup>61</sup> Depending on the extent to which competition can successfully eradicate lender surplus, the overall effect of persistence of either type of mistake is some

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61. See, e.g., Ausubel, *supra* note 42, 56–64 (demonstrating empirically that the credit card industry earns supracompetitive profits compared to other banking activities, despite the industry's low concentration and low barrier to entry).

combination of rent extraction and a cross-subsidization of sophisticated consumers by unsophisticated consumers.

This brings us to ask whether there are normative policy implications for consumers' failure-to-switch mistakes. The Bureau's stated central mission on its website is "to make markets for consumer financial products and services work for Americans—whether they are applying for a mortgage, choosing among credit cards, or using any number of other consumer financial products."<sup>62</sup> According to the statute, Congress charged the Bureau with ensuring that: (i) all consumers have access to markets for consumer financial products and services; and (ii) markets for consumer financial products and services are fair, transparent, and competitive. One can certainly advance an argument that market obfuscation leading to cross-subsidization violates the condition that these markets should be "fair" and "transparent." To this extent, measures to help unsophisticated consumers will promote distributional equity. One could also argue—somewhat agnostically—that given that Congress has already chosen to intervene to correct product-choice mistakes, any rationale for such intervention will likewise carry over to failure-to-switch mistakes as well.

Economists, however, generally prefer to see policy objectives in terms of increasing society's total wealth. This poses a threshold challenge for consumer financial protection regulation because measures to help consumers refinance more efficiently—along with other measures of consumer financial protection—largely facilitate *transfers*. The direct effect is a transfer from lenders to unsophisticated consumers. The failure-to-switch problem deals with an existing payment obligation that will continue to provide interest costs to lenders. An efficient switch would allow the consumer to reduce interest payments and thereby maintain a greater wealth. In the cumulative, the amount saved by consumers through refinancing will generally equal the foregone interest collected by the incumbent lender minus the interest costs collected by the new lender and other transaction costs. Put differently, the amount saved by consumers as a group will generally equal the amount lost by lenders as a group minus other transaction costs. As an indirect effect, these measures will end up mitigating the existing cross-subsidization under competition. This indicates a *de facto* transfer from sophisticated consumers to unsophisticated consumers. But transfers do not directly increase society's overall wealth. Furthermore, because there are transaction costs associated with more frequent refinancing, there can be substantial economic *costs* involved in effecting such transfers—some of which may not otherwise

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62. Consumer Financial Protection Bureau, *Learn About the Bureau*, CFPB (Dec. 6, 2001), <http://www.consumerfinance.gov/the-bureau/>.

generate additional value for consumers or lenders.

For these reasons, most of the typical justifications for government intervention in this area have appealed to arguments based on negative externalities of having households holding high-level debts as economic costs to society.<sup>63</sup> Households holding high-level debts are more likely to default, to file for bankruptcy, and to result in foreclosure of their properties. Bankruptcy filings and foreclosures use up valuable social resources. Foreclosures tend to bring down prices of neighboring houses. There are also adverse consequences to the economy at large in terms of unemployment rates and reduced consumption levels.<sup>64</sup> Indeed, in the most recent financial crisis, the private debt crisis expanded into a public debt crisis. Finally, some have argued that the harm from consumer indebtedness extends beyond monetary outcomes. One study documents causal effects between high debt levels and deterioration of physical and mental health of the debtors.<sup>65</sup> It is at least plausible that, taking all these factors into consideration, these economic costs can exceed the transaction costs involved in facilitating individual refinancing. To this extent, more efficient refinancing may be justified on the grounds of reduced default risks and other associated externalities.

There are also more nuanced arguments appealing to improved allocative efficiency. In the case of consumer credit market, there are potentially two sources of deadweight costs: among those who participate in the market and among those who choose not to do so. Consider first product-choice mistakes. These mistakes introduce a deadweight loss as a result of consumers who take out mortgages without fully internalizing all the hidden, add-on costs of borrowing: the effective demand curve is therefore shifted out as compared to what the true demand curve would be under perfect information.

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63. For more types of economic costs arising from consumer credit, see Bar-Gill & Warren, *supra* note 7, at 56–64 (noting monetary costs associated with consumers' failure to switch cards after introductory periods, the negative economic effects of consumers choosing plans not necessary in their best financial interest, and the impediment consumer mistakes pose to subprime market competition); *see also* Campbell, *Consumer Financial Protection*, *supra* note 1, at 96 (discussing four rationales for government policy in consumer financial protection).

64. Mian & Sufi argue that household debt is one of the principal causes of the financial crisis and the ensuing recession. Mian & Sufi, *supra* note 2, at 1462–63. In particular, they find that household leverage growth and credit card borrowing prior to the crisis is related to subsequent adverse changes in household defaults, unemployment, and consumption within U.S. counties. *Id.* at 1492.

65. Matthias Keese & Hendrik Schmitz, *Broke, Ill, and Obese: The Effect of Household Debt on Health* (Ruhr Econ. Paper No. 234, 2010), available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1735420](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1735420) (documenting that household debt causally deteriorates physical and mental health).

A parallel argument can apply to failure-to-switch mistakes. These mistakes would introduce a deadweight loss if sluggish refinancers could not properly anticipate their likely failure-to-switch mistakes in the future, and thus they do not properly price their future difficulty of refinancing in choosing among various mortgage products.

A weak form of testing this hypothesis may be to compare the different patterns of mortgage choices between sophisticated households and unsophisticated households. If we assume there is no systematic difference in the risk-preferences between sophisticated and unsophisticated households, then unsophisticated households should be marginally more willing to choose ARMs rather than FRMs.<sup>66</sup> This is because, all else equal, the option to actively refinance on the borrower's own initiative should not be as valuable to unsophisticated households, as it is to sophisticated households. Noticing that recent evidence, by contrast, shows that ARMs were favored by better-educated households, Campbell concludes that "it does not seem that households that lack the knowledge to refinance FRMs substitute away from these mortgage contracts in a way that would be analogous to nonparticipation as a response to lack of knowledge about the stock market."<sup>67</sup> In this sense, since unsophisticated households are not properly pricing the difficulty of refinancing in their initial mortgage product decisions, stimulating more efficient refinancing may reduce the deadweight loss in the original financing product market, and in turn, the spread between ARM rates and FRM rates may more accurately reflect the substitution effects between the two.

There is another potential source of allocative inefficiency from those who, as a result of market obfuscation, may refuse to participate in the financial market altogether.<sup>68</sup> To be sure, this is a different group of consumers than the ones subject to product-choice mistakes and failure-to-switch mistakes. This Article has focused on the segment of consumers who are initially exogenously motivated to take out mortgages but then decide not to participate in the financial market due to market obfuscation. But there may be a more risk-averse segment among unsophisticated consumers who do not trust the financial market or themselves to efficiently manage their mortgages. They may choose to abstain from purchasing mortgage products altogether. To the extent that market transparency is capable of ameliorating both product-choice mistakes and failure-to-switch mistakes, it can increase the demand from these consumers and result in additional gains in efficiency.

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66. Campbell, *Household Finance*, *supra* note 13, at 1585.

67. *Id.*

68. See, e.g., Campbell, *Consumer Financial Protection*, *supra* note 1, at 93 ("[L]ack of financial market participation can be a serious mistake . . .").

What will then be the likely economic effects of facilitating more efficient refinancing? Here again, the economic effects are expected to be similar in nature to those of reducing product-choice mistakes. As discussed above, measures to correct both types of mistakes have the direct effect of reducing profitable, rent-extracting opportunities for lenders and also of mitigating cross-subsidization. In the case of product-choice mistakes, corrective measures will lead to a reduce likelihood that unsophisticated consumers will choose dangerous products that are more profitable to lenders; in the case of failure-to-switch mistakes, corrective measures will lead to profit streams from sustained interest payments being reduced. To the extent that corrective measures for either type of mistake will mitigate the effect of cross-subsidization, they are expected to lead to some welfare loss for currently sophisticated consumers. No doubt our analogy does break down at some point: to the extent that transaction costs, such as appraisal fees, are involved in mortgage refinancing, more efficient refinancing activities impose a cost on society which is not germane to efficient product-choice decisions.

The difficult part is predicting how lenders may respond once a significant fraction of sluggish refinancers begin switching efficiently. Here we only offer speculative discussions.

If the government can encourage more efficient refinancing when the rates decline, lenders will face a higher prepayment risk. They may respond by raising interest rates, charging higher fees, or more vigorously enforcing prepayment penalty clauses to make up for the lost profit opportunities. Initially, raising interest rates across the board is the most natural response—and this is likely given that the rate has been at an all-time low recently. But at some point, lenders may not find it profitable to raise interest rates due to a potential adverse selection problem. Stiglitz and Weiss have argued that higher interest rates may have a sorting effect of attracting only risky borrowers.<sup>69</sup> Martin and Smyth similarly note that “[h]igh interest rates may adversely affect the pool of potential borrowers from which the bank must choose its loan portfolio and they may have undesirable incentive effects on the borrower’s post-contractual behavior.”<sup>70</sup> As long as lenders cannot perfectly screen borrower types, lenders will face the adverse selection problem in raising interest rates. In addition, even without adverse selection, higher interest rates can themselves be the cause of higher default risks by borrowers.

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69. Joseph E. Stiglitz & Andrew Weiss, *Credit Rationing in Markets with Imperfect Information*, 71 AMER. ECON. REV. 393, 408 (1981).

70. Robert E. Martin & David J. Smyth, *Adverse Selection and Moral Hazard Effects in the Mortgage Market: An Empirical Analysis*, 57 S. ECON. J. 1071, 1072 (1991). Martin and Smyth went on to predict the critical rate to be around 11 percent.

Eventually, lenders may have to respond by raising upfront lender fees or increasing other types of fees, such as late payment penalties. Because lender fees are not “credit-sensitive portions of prices,”<sup>71</sup> raising lender fees will not effect in any adverse selection. The overall effect will be a more equitable distribution of the total cost of borrowing among sophisticated and unsophisticated consumers.

Finally, we also mention a potential unintended consequence of promoting market transparency and assisting unsophisticated households. Although our discussion thus far has assumed that consumers come in binary types—either sophisticated or unsophisticated—in reality, consumers come with a spectrum of sophistication. It may not be possible, or even cost-effective, to offer a level of transparency that can place *all* consumers on a level playing field. At a theoretical level, there is concern that a regulatory effort to promote market transparency may actually exacerbate the cross-subsidization effect. This may be the case if the market becomes only so transparent as to reach only a fraction of the currently-unsophisticated consumers and otherwise fails to be equally transparent for all consumers. This problem is not limited to the market for consumer credit; the same concern can be raised in securities regulation and any other market where consumer sophistication or informedness is a factor. Ultimately, whether regulation can mitigate or exacerbate cross-subsidization is an empirical question, and one germane to the particular design of each regulatory proposal. Nevertheless, we simply note that the regulator need remain mindful of this possible outcome.

#### D. *Ex Ante Efficiency versus Ex Post Welfare*

We next ask whether helping consumers improve their ex post welfare can have an adverse effect on ex ante efficiency. The law-and-economics literature on contracts is rife with theoretical tradeoffs between ex ante efficiency and ex post welfare.<sup>72</sup> Renegotiation increases ex post welfare but its possibility diminishes incentives to make proper ex ante investments; commitment devices encourage efficient ex ante investments but restrict mutually welfare-enhancing negotiation after the fact. Likewise, could mitigating the failure-to-switch problem discourage consumers from properly investing into choosing the suitable credit product initially—thereby reducing ex ante efficiency? Theoretically, yes. All else

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71. Ausubel, *supra* note 42, at 71.

72. *E.g.*, Oliver Hart & John Moore, *Incomplete Contracts and Renegotiation*, 56 *ECONOMETRICA* 755, 775 (1988) (identifying the connection between ex ante incomplete contracts and ex post revisions of terms).

equal, consumers spend more time purchasing non-refundable products than refundable ones.

But we mention several mitigating factors in this market. First, it is always possible that the market conditions may never improve during the term of the loan—meaning there is no opportunity to make use of welfare-improving refinancing and the refund option may never be exercised. Second and more importantly, some, if not all, of the ex ante effort is transferable for ex post welfare improvement: the consumer expecting to efficiently switch later still benefits from early investment because he will still need to understand how certain credit terms apply when they decide to switch. Therefore, researching into the terms of various products the first time will assist him later. Since a methodology-based refinancing we proposed in this Article capitalizes on the consumer's earlier investment to save his future information cost, there is likely to be little contravening effect. Third, empirical evidence indicates that those most likely to fail to switch are those most likely to not properly invest in—or make initial mistakes in—the initial financing decisions. This indicates that, empirically speaking, those who are already skilled at refinancing will stand to gain relatively little from regulation, and thus will not be seriously discouraged by ex ante investment; conversely, those who stand to gain the most from regulation are already investing suboptimally in choosing the right mortgage products. For these reasons, we do not believe the government's effort to address the failure-to-switch problem will significantly undermine ex ante efficiency.

### III. PROPOSALS FOR ADDRESSING FAILURE-TO-SWITCH MISTAKES

Government-initiated solutions to stimulate efficient refinancing among consumers can come in varying degrees of intrusiveness. As mentioned above, to the extent that status quo bias or consumer inertia can account for some of the sluggishness of refinancing, we do believe ultimately some type of automation is desirable. For this reason, some scholars, such as Nalebuff and Ayres<sup>73</sup> and Campbell,<sup>74</sup> have been arguing for automatic refinancing mortgage products whose rates can only adjust downward, but very few lenders have shown interest in marketing such products, and only at an interest rate above the prevailing fixed rate.<sup>75</sup>

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73. BARRY NALEBUFF & IAN AYRES, *WHY NOT?: HOW TO USE EVERYDAY INGENUITY TO SOLVE PROBLEMS BIG AND SMALL* (2006).

74. *See, e.g.,* Campbell, *Household Finance*, *supra* note 13, at 1580 (analyzing low-income and minority mortgage borrowers' default and prepayment habits, and the consequences thereof on mortgage pricing).

75. Broderick Perkins, *Great Idea: The Automatic Rate Reduction Loan*, REALITYTIMES

Congress can choose to mandate all lenders to offer such products as the default mortgage products, although it will be a difficult proposal from a political perspective. But even if this option was politically viable, it is not clear that this solution is sufficiently general. Borrowers may want to hedge against a number of different risks in addition to the inflation risk—for example, the credit spread risk. Congress can also legislate to reduce any redundant costs involved in refinancing. Nelson and Whitman, for example, argue that under the proper use of the doctrine of equitable mortgage subrogation from THE RESTATEMENT (THIRD) OF PROPERTY: MORTGAGES, lenders should be able to elect to forego their current requirement of reissuing title insurance.<sup>76</sup> The government may also choose to selectively subsidize refinancing costs for a certain group of borrowers, although this may raise a moral hazard problem.

We do not question the usefulness or desirability of these proposals—in fact, we support them. At the same time, we also think we might be getting ahead of ourselves in these discussions, without trying more modest and obvious regulatory solutions that can address at least a part of the noted problem. In this section, we discuss an initial regulatory option that is less intrusive and more intuitive. The approach we suggest is also consistent with the government’s approach to mandating more effective disclosure, and also with the Bureau duty to promote “fair, transparent, and competitive” mortgage markets. The main idea is that if borrowers fail to switch in part due to the lack of credible mechanism of communication and the lack of incentives for lenders or brokers to reveal potentially useful information, it may be sensible to promote (i) information-de-shrouding in the market to educate consumers, (ii) information-certification to instill consumers with a sense of trust, (iii) a clear calculation of potential long-term costs and benefits of switching so as to de-bias the consumers of their lack of self-awareness, and (iv) a reduction of information cost for consumers.

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(May 7, 1999), [http://realtytimes.com/rtpages/19990507\\_autorefi.htm](http://realtytimes.com/rtpages/19990507_autorefi.htm); *Automatic Rate Cut Refinancing*, DEBTHELP.COM (Aug. 25, 2006), <http://www.debthelp.com/kc/54-automatic-rate-cut-refinancing.html>.

76. See, e.g., Grant S. Nelson & Dale A. Whitman, *Adopting Restatement Mortgage Subrogation Principles: Saving Billions of Dollars for Refinancing Homeowners*, 2006 B.Y.U. L. REV. 305 (2006) (discussing how lenders may elect to forego their current requirement of reissuing title insurance under the proper use of the doctrine of equitable mortgage subrogation from THE RESTATEMENT (THIRD) OF PROPERTY: MORTGAGES).

A. *Government-Certified Product-Comparison Methodology*

The Bureau should consider establishing, certifying, and popularizing a general product-comparison methodology and a catchy concept—a common language of sorts—which can be used to empower consumers in assessing whether a new product is welfare-improving as compared to the existing product under various future states. Just as effective disclosure regulation is intended to empower consumers to choose suitable credit products by dictating the terms and the manner of disclosure, an effective and trusted comparison methodology and concept can empower consumers to make right comparisons and switch their products in certain instances, resulting in guaranteed net benefits.

Take Annual Percent Rate (“APR”), for example. There is nothing special or overly technical about this concept, and yet APR calculation is governed by the Truth-in-Lending Act (“TILA”), which dictates what costs must be included in calculating APR. This allows borrowers to compare various mortgage products. Otherwise, lenders could use various different concepts of interest rates to market their products: simple monthly, simple annual, compound monthly, compound annually, annual rate in advance, etc. TILA created the concept of APR to “allow consumers to make an ‘apples to apples’ comparison . . . using a consistent formulation that lenders were required to use.”<sup>77</sup> APR thus provides a simple language borrowers can use to inquire about the effective interest rate. In theory, lenders are not permitted to use APR to mean anything other than how TILA specifies it to be.

However, in practice, APR has several failings. First, not everyone understands the concept of APR as distinct from interest rate.<sup>78</sup> Second, even with the effort of regulation, there still remain discrepancies in which fixed costs get included in the APR.<sup>79</sup> Third, mortgage APRs do not account for consumers’ tax deductions, and thus are incomplete insofar as capturing the full financial effect of borrowing. Fourth, APR can be misleading because it assumes the underlying loan to run its full-term.

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77. Jerry Wegman, *A Failure of Credit Regulation: The Case of NCAS of Delaware*, 13 PROC. ACAD. LEGAL ETHICAL & REG. ISSUES 22, 23 (2009).

78. Marianne Bertrand & Adair Morse, *Information Disclosure, Cognitive Biases and Payday Borrowing*, at 5 (Chi. Booth Research Paper, Working Paper No. 10-01, 2009), available at <http://faculty.chicagobooth.edu/marianne.bertrand/research/PayField091008.pdf> (stating that “[b]orrowers could be financially unsophisticated such that they do not understand why or how an APR should matter”).

79. See, e.g., *Annual Percent Rate*, WIKIPEDIA.ORG (Oct. 21, 2011, 09:10 AM), [http://en.wikipedia.org/wiki/Annual\\_percentage\\_rate](http://en.wikipedia.org/wiki/Annual_percentage_rate) (discussing how Truth-in-Lending Act leaves discretion as to whether mortgage lenders need to include certain fixed costs in calculating APR).

McClatchey and de la Torre<sup>80</sup> and Buch et al.<sup>81</sup> argue therefore that the APR calculation should be modified to account for each consumer's specific time horizon. Fifth, borrowers may not react sensitively to the disclosure of APR because it carries little emotional salience as an economic cost.<sup>82</sup> On the other hand, the authors did find that presenting the added-up dollar-cost of the loan did have an effect on borrowers' tendency to take out loans.<sup>83</sup> Sixth, while APRs may facilitate a comparison among existing products, they do not present an obvious mechanism for comparing the existing loan obligation against the new product and as such may be useless in stimulating refinancing.

The current disclosure requirement for refinancing includes a number of items about the new loan, but very little is required in terms of helping consumers *compare* a new loan to their existing loan obligations. Online loan calculators, which seek to assist consumers in this particular aspect, are not standardized and they vary in terms of the factors they include in their output. As such, a consumer may obtain multiple different results depending on the calculator she happens to come across.

The Bureau should test various methodologies and see which concepts tend to be most salient and useful for consumers. Here, we list a few preliminary concepts that may be useful to consumers in deciding whether to refinance:

- *Year-by-Year Cumulative Net Out-of-Pocket Expense Savings* (“*n*-year CNOPEs”). This figure would indicate the dollar value of the amount of money the borrower will end up saving over the course of *n* years under the assumption of full and timely payments. This should include interest costs minus tax deduction, plus other costs involved refinancing, but would not include payments towards the principal. For a thirty-year fixed rate mortgage, a thirty-year CNOPEs would essentially compare the total interest costs plus closing costs against the remaining interest costs under the existing obligation. If refinancing entails a substantial closing cost, then one-year CNOPEs and two-year CNOPEs may actually be negative.

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80. Christine McClatchey & Cris de la Torre, *Comparing Fixed-Rate Mortgage Loans via the APR: Cautions and Caveats* (Working Paper, 2011), available at [http://www.mcb.unco.edu/Faculty/workingPapers/JFSP%20submission%20\\_2\\_.pdf](http://www.mcb.unco.edu/Faculty/workingPapers/JFSP%20submission%20_2_.pdf).

81. Joshua Buch et al., *The Usefulness of the APR for Mortgage Marketing in the USA and the UK*, 20 INT'L J. BANK MARKETING 76, 83–84 (2002).

82. Bertrand & Morse, *supra* note 76, at 5–9.

83. *Id.*

- *Comparative Risk Factors* (“*CR Factors*”). This would be a description of future states under which the borrower would be worse off than under his current existing obligation. This may be relevant if the new loan includes a prepayment penalty clause, which either did not exist in the original loan or existed in a smaller amount or phased out much earlier. If the new loan has a higher late payment penalty, then this factor would also be highlighted. If the borrower is going from an FRM to an ARM, then the future state where interest rate spikes up would also be explained. If the new loan entails a substantial closing cost, then this would also include a situation where the borrower has to move or otherwise prepay earlier than can reap net savings. Comparison would be particularly easy for consumers in cases where there are *no* future states under which the borrower may be worse off under the new loan than under the existing loan—such as a no-closing cost loan with a reduced rate, which otherwise matches all other terms of the existing loan.

In any financial transaction, the party entering it should care about (i) expected returns and (ii) accompanying risks. The concepts listed above are intended to capture those two factors transparently. In addition, consumers typically want to know how long they must stay in their current homes to come out even, if they were to refinance. The first concept captures this information as well.

Just like APR, there is nothing technical about these concepts, and one would hope that consumers are already taking these concepts into account in choosing to refinance. Nevertheless, there will be a benefit for the Bureau to regulate these concepts in a uniform, consistent, and intuitive manner and popularize them so as to facilitate easy communication with lenders. Once these concepts become popularized, consumers may start demanding such information from lenders or brokers.

Borrowers can use these concepts to protect themselves and to save on information costs. A broker approaches him with a product, and a borrower may ask for a table of CNOPEs and comparative risk factors. Encouraging borrowers to use a methodology-based refinancing strategy as the default refinancing option will likely protect borrowers and also allow them to not worry about potential downside risks. Because the borrower is more likely to have invested in his original product and be familiar with the terms, he can benefit from the reduced cost of not having to worry about hidden information. Likewise, the Bureau can mandate all brokers providing refinancing options to display the information comparing the two products under this methodology, which will tend to highlight the precise

terms that render the new mortgage product to be not directly comparable to the existing one.

*B. Applications*

We believe the approach we recommend will indeed empower consumers and motivate them to search and switch more efficiently, knowing that information can be demanded and presented in a relatively simple format. But this may not be enough to encourage all borrowers to seek timely refinancing. There are further applications that can come about—either by means of further regulation or as a result of market forces—once we have those concepts standardized.

For example, frequently, a consumer will qualify for a lower interest rate mortgage offered by the incumbent lender. The lender may recognize this but rationally abstain from sharing this information. The burden for seeking out this opportunity thus lies with the consumer. One benefit of refinancing with the incumbent lender is that the lender already has a great deal of information about the consumer and the property, and therefore, there may be a substantial saving in the transaction costs. To this extent, a simple disclosure regulation may alleviate this problem and reduce the burden on the consumers of constantly inquiring the bank. If it is within the scope of the Bureau's authority, it can consider mandating lenders to send out periodic mailing to their consumers, letting them know of the best available products they are currently offering and how they compare to the borrower's existing mortgage obligation under the product-comparison methodology. The lender may choose to market new products of its own in various manners. The difference is that the notice sent out according to the disclosure regulation must be limited to providing information about the best available products that guarantee savings.

There may be a number of market-based solutions, which can further mitigate the problem of consumer inertia. For example, an agent or a commercial vendor may be given a limited power-of-attorney of refinancing whereby he can only refinance to mortgages that meet the welfare-improving standard the borrower specifies. A mortgage registry may facilitate refinancing auctions, whereby borrowers can upload their information, competing lenders can bid, and the lender offering the best term can take away the mortgage contract for a specified period. If effective, this registry can also erode the monopolistic informational advantage the incumbent lender has over other lenders. This set-up also reduces consumers' search costs because lenders have an incentive to compete over even obscure terms that increase the risk associated with the mortgage but that the consumers may not have noticed initially. The

market may even evolve towards a condition where professional liability managers can make refinancing decisions for consumers in return for a commission based on a fraction of CNOPEs. Having liability managers make refinancing decisions can also be beneficial to the extent that they may be more knowledgeable about making optimal refinancing decisions—including the time value of waiting—rather than simply extracting the amount of surplus available at any given time.

#### IV. CONCLUSION

In this Article, we analyzed consumers' failure-to-switch mistakes in the mortgage market—a particular class of consumer mistakes that has not received much attention from regulators or policymakers. Failure-to-switch mistakes share causal and consequential similarities with product-choice mistakes. In fact, we believe they are simply different manifestations of the same type of market failures that permit market obfuscation. By applying the economic theory of product-choice mistakes, we provided a framework for understanding why failure-to-switch mistakes persist among unsophisticated borrowers and why the market is unlikely to provide the socially optimal level of transparency to promote efficient refinancing.

Given the government's policy decision to address product-choice mistakes, we believe there is little reason for it to stay away from addressing failure-to-switch mistakes. We emphasize the information certification role the Bureau can play by establishing and popularizing concepts and methodologies that can reduce the information cost of search and switching. If successful, these measures can reduce the information rent lenders currently collect, mitigate the potential cross-subsidization of sophisticated consumers by naïve consumers, reduce negative externalities associated with high household debt levels, and reduce deadweight losses that arise from market obfuscation.

## APPENDIX

Proposition 1 (Failure-to-Switch Mistakes). If lenders cannot credibly convey the true interest rate, there is a uniformly-distributed obfuscation in the market. The consumer accordingly must incur a search cost to understand the terms of the product, which is strictly convex on the level of obfuscation. Sluggish refinancing behaviors will then appear in the form of consumers' failures to make timely refinancing switches. In addition, as empirically observed, the lag will increase in the level of obfuscation and the personal search cost coefficient, and will decrease in the principal remaining.

*Proof.* Suppose the consumer is currently paying a mortgage whose interest rate is  $r_1$ , with the remaining principle  $p_1$ . Let  $c_1$  be the net present interest cost over the remainder term (including tax deduction and insurance fee). Let  $c(r, p) = pTr$  be the net present interest cost (minus tax deduction and other miscellaneous costs) of a new mortgage with *effective* interest rate  $r$  and principle  $p$ , where  $T$  is the term of the loan. Let  $c_f$  be the closing cost that must be incurred upon refinancing. ( $c_f$  may be zero for no-closing cost refinancing). Suppose the consumer demands at least a saving of  $F$  through refinancing. If  $r^* < r_1$  is the cutoff interest rate optimal for refinancing, we need  $c(r^*, p_1) + c_f = c_1 - F$ . (This model does not incorporate the option-value of waiting.)

The consumer observes a signal  $\sigma$  from lenders. Given  $\sigma$ , the actual effective interest rate of the product is uniformly distributed between  $[\sigma, \sigma + \varepsilon]$ . Therefore,  $E(r|\sigma) = \sigma + \frac{\varepsilon}{2}$ .  $\varepsilon$  is the level of obfuscation: the signal is perfect when  $\varepsilon = 0$ , but is otherwise imperfect. The consumer is aware of  $\varepsilon$  and must incur a search cost of  $s(\varepsilon) = K\varepsilon^2$  to fully verify the offer, where  $K > 0$ . As mentioned in the text, this functional form of the search cost is chosen to satisfy three conditions: the search cost is (i) zero when  $\varepsilon = 0$ , (ii) increasing in  $\varepsilon$ , and (iii) strictly convex in the level of obfuscation.

From the perspective of the social planner, he would want the consumer to switch when the expected interest rate is less than or equal to  $r^*$ . Since  $E(r|\sigma) = \sigma + \frac{\varepsilon}{2}$ , we want the consumer to switch to a product when the signal is  $(r^* - \frac{\varepsilon}{2})$  or less. Therefore, let  $\sigma^s(r^*) = (r^* - \frac{\varepsilon}{2})$  be the social planner's signal choice.

But the consumer will search into the new product only if the expected benefit of the search is greater than the search cost. Upon observing  $\sigma$ , the search may turn into the following benefit:

$$\begin{aligned} &\text{Benefit from searching} = \\ &\begin{cases} c_1 - c_f - F - c(r, p_1) = c(r^*, p_1) - c(r, p_1) & \text{if } r < r^* \\ 0, & \text{otherwise.} \end{cases} \end{aligned}$$

Therefore, the cutoff value for  $\sigma$  that prompts the consumer to search is determined by the following condition:

$$\int_{\sigma}^{\sigma+\varepsilon} P(r < r^* | \sigma) (c(r^*, p_1) - c(r, p_1)) dr > s(\varepsilon) = K\varepsilon^2, \text{ where}$$

$$P(r < r^* | \sigma) = \begin{cases} \frac{r^* - \sigma}{\varepsilon} & \text{if } \sigma \in [r^* - \varepsilon, r^*] \\ 0 & \text{if } \sigma > r^* \\ 1 & \text{if } \sigma < r^* - \varepsilon \end{cases}$$

Within  $\sigma \in [r^* - \varepsilon, r^*]$ , the integral leads to the following search condition: Search if and only if

$$(\sigma - r^*) \left( \sigma - \left( r^* - \frac{\varepsilon}{2} \right) \right) > \frac{K}{p_1 T} \varepsilon^2 \text{ given } \sigma \in [r^* - \varepsilon, r^*].$$

Solving this inequality, we get the following cutoff condition: search if and only if

$$\sigma \leq \sigma^P(r^*) = \left( r^* - \frac{\varepsilon}{2} \right) - \frac{\varepsilon}{4} \left( \sqrt{1 + \frac{16K}{p_1 T}} - 1 \right) < \left( r^* - \frac{\varepsilon}{2} \right) = \sigma^S(r^*)$$

The consumer's private signal threshold  $\sigma^P(r^*)$  is thus lower than  $\sigma^S(r^*)$ , the social planner's threshold for having consumers switch, as long as there is a positive amount obfuscation,  $\varepsilon > 0$ . This means that on average the consumer will wait until the interest rate declines further.

Let the following denote the lag between the socially desirable refinancing cutoff and the privately desirable refinancing cutoff, or the premium demanded by unsophisticated borrowers before searching:

$$\Delta(\varepsilon, K, p_1) = \sigma^P(r^*) - \sigma^S(r^*) = \frac{\varepsilon}{4} \left( \sqrt{1 + \frac{16K}{p_1 T}} - 1 \right) > 0$$

Notice that  $\Delta(\varepsilon, K, p_1)$  increases in  $\varepsilon$  and  $K$ , and decreases in  $p_1$ . Therefore, the noisier the signal, the higher the search cost, thus the more likely the consumer will wait until a lower signal to search; the higher the remaining principal, the more likely the consumer will search sooner (comparatively).

Implicit in our assumption is that consumers are boundedly rational. If consumers were perfectly rational, they could learn eventually that their individually rational response to market obfuscation would result in their failure to make timely switches. In that case, they could update their strategies by searching earlier than they may be motivated. *Q.E.D.*

In the following Proposition, we model a competition between two mortgage lenders in an infinitely repeated game and prove the following proposition.

**Proposition 2 (Lender Collusion).** Suppose the following three conditions hold: (i) lenders do not discount the future too much, (ii) lenders expect interest rates will continue to decline, and (iii) there is a positive fraction of population that is ignorant of interest rate changes, or otherwise insensitive to interest rate changes, unless specially made aware of those changes (as in Proposition 1). Then a Nash equilibrium exists in an infinitely repeated game under which lenders will continue to compete for new borrowers, but will not make special effort—even if it's costless—to entice their competitors' existing borrowers by undercutting the interest rates.

*Proof.* Suppose the economy comes with two lenders,  $A$  and  $B$ . There is a continuum of population of size 1, of which  $\rho \in (0,1)$  is the fraction keenly aware of each period's effective interest rate and always refinances whenever a lower rate comes along. They can refinance costlessly, but the result is stronger if we assume costly refinancing. By contrast,  $1 - \rho$  remains ignorant of interest rate changes unless specifically approached by a better offer.

In each period  $k$ , the interest rate  $i_k \in (0,1)$  is announced by the government.  $\alpha_k \in (0,1)$  is the fraction of the population come to lenders  $A$  and  $B$  to seek financing.  $A$  and  $B$  compete for borrowers by simultaneously announcing the interest rate  $j_{Ak}$  and  $j_{Bk}$ . At equilibrium,  $j_{Ak} = j_{Bk} = i_k$  for every period  $k$ .  $A$  and  $B$  evenly split the consumers, and  $\alpha_k$  begin paying interest rate  $i_k$  from period  $k$  until  $k + T$ .  $T$  is the term of the loan and can be thought of as 360 months, for example.  $\rho \alpha_k$  of them are rate sensitive, and  $(1 - \rho)\alpha_k$  is ignorant and continue to pay  $i_k$  for  $T$  terms, unless a lender makes special effort to reach them through advertisement. Because lenders can refinance costlessly, when the interest rate declines, they earn positive profit from  $(1 - \rho)$  of the borrowers who do not refinance; meanwhile, lenders earn zero profit from  $\rho$  of them.

For each period,  $A$  and  $B$  both have two potential strategies: *advertise* or *not advertise*. Advertisement is costless. If neither advertises, then the two lenders continue to split the borrowers and hold onto their incumbent borrowers who do not refinance. Therefore, in period  $k$ , each earns the following profit:

$$\pi_k = \frac{1}{2} \sum_{m=f}^k \alpha_m (1 - \rho) (i_m - \min\{i_1, \dots, i_k\}),$$

Where  $f = \min\{1, k - T + 1\}$ . This is an infinitely repeated game between  $A$  and  $B$ . Suppose in one period  $k$ ,  $A$  decides to advertise, while  $B$  does not.

In that case,  $A$  can approach each of  $(1 - \rho)\alpha_{k-T+1}, \dots, (1 - \rho)\alpha_k$  and slightly undercut the interest rate each group are paying, in case they are paying above  $i_k$ . Then in this period,  $A$  steals away additional

$$\tau_k = \frac{1}{2} \sum_{i_m > i_k, m > f} \alpha_m (1 - \rho) (i_m - \min\{i_1, \dots, i_k\}) < \pi_k.$$

from  $B$  for this period. If they both advertise, then they again engage in Bertrand competition for each of  $(1 - \rho)\alpha_1, \dots, (1 - \rho)\alpha_k$ , and thus each party ends up losing

$$\tau_k = \frac{1}{2} \sum_{i_m > i_k, m > f} \alpha_m (1 - \rho) (i_m - \min\{i_1, \dots, i_k\}),$$

since those borrowers will be offered the current best interest rate,  $i_k$ . Therefore, the normal form of the period  $k$  stage game is as follows:

$B$	
	<i>Advertise</i> <i>Not Advertise</i>
<i>Advertise</i>	$\pi_k - \tau_k, \pi_k - \tau_k$ $\pi_k + \tau_k, \pi_k - \tau_k$
<i>Not Advertise</i>	$\pi_k - \tau_k, \pi_k + \tau_k$ $\pi_k, \pi_k$

In terms of the stage game, (*Advertise, Advertise*) is the unique Nash equilibrium. However, in the infinitely repeated game, this does not necessarily hold. Suppose both  $A$  and  $B$  play according to the following strategy: (*Not Advertise* each period until the opponent chooses *Advertise*, after which, always *Advertise*). In this case, if either player advertises, then both players earn zero profits for the remainder of the game. Therefore, if  $A$  is thinking about advertising in period  $k$ , it will compare the additional profit it reaps through advertising  $\tau_k$  against all future profits it will forego, which is

$$\sigma_k = \sum_{n=k+1}^{\infty} \delta^{n-k} \pi_n.$$

$A$  will not advertise, so long as  $\tau_k < \sigma_k$ , or

$$\begin{aligned} \frac{1}{2} i_m > i_k, m > f \alpha_m (1 - \rho) (i_m - \min\{i_1, \dots, i_k\}) \\ < \frac{1}{2} \sum_{n=k+1}^{\infty} \delta^{n-k} \sum_{m=f}^n \alpha_m (1 - \rho) (i_m - \min\{i_1, \dots, i_n\}). \end{aligned}$$

Notice first that this condition is never satisfied if  $\rho = 0$ , meaning there has to be borrowers who are unaware of interest rate changes, or are otherwise insensitive to interest rate changes. If  $i_k$  is continually decreasing, then we can assume the minimum interest rate is always the latest, and the above inequality can be rewritten as

$$\sum_{m=f}^k \alpha_m(1-\rho)(i_m - i_k) < \sum_{n=k+1}^{\infty} \delta^{n-k} \sum_{m=f}^n \alpha_m(1-\rho)(i_m - i_n).$$

The first-term of the right hand side is

$$\begin{aligned} & \delta \sum_{m=f}^{k+1} \alpha_m(1-\rho)(i_m - i_{k+1}) \\ & > \delta \sum_{m=f}^{k+1} \alpha_m(1-\rho)(i_m - i_k) \\ & > \delta \sum_{m=f}^k \alpha_m(1-\rho)(i_m - i_k) = \delta \tau_k \end{aligned}$$

So  $\sigma_k > \delta \tau_k$ . Since  $\delta$  can be assumed to be arbitrarily close to 1, we must have  $\sigma_k > \tau_k$ . In other words, the condition for perpetually not advertising is established. *Q.E.D.*